USING TIMING SIGNALS TO DETERMINE PROXIMITY BETWEEN TWO NODES

This invention relates to the field of communications security, and in particular, to a system and method that

5   verifies the proximity of a node on a network.

Network security can often be enhanced by distinguishing between 'local' nodes and 'remote' nodes on the network. In like manner, different rights or restrictions may be imposed on the distribution of material to nodes, based on whether

10   the node is local or remote. Local nodes, for example, are typically located within a particular physical environment, and it can be assumed that users within this physical environment are authorized to access the network and/or authorized to receive files from other local nodes. Remote

15   nodes, on the other hand, are susceptible to unauthorized physical access. Additionally, unauthorized intruders on a network typically access the network remotely, via telephone or other communication channels. Because of the susceptibility of the network to unauthorized access via

20   remote nodes, network security and/or copy protection can be enhanced by imposing stringent security measures and/or access restrictions on remote nodes, while not encumbering local nodes with these same restrictions.

It is an object of this invention to provide a system

25   and method that facilitates a determination of whether a node on a network is local or remote. It is a further object of this invention to integrate this determination with a system or method that enforces security measures and access restrictions based on whether the node is local or remote.

30   These objects and others are achieved by a system and method that facilitates a determination of communication time between a source node and a target node. The proximity of the target node to the source node is determined from the

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communication time. The source node communicates a query, or "ping", to the target node. The target node is configured to automatically send a response to the sender of such a query. The communication time is determined based on the time

5 duration between the transmission of the query and receipt of the response at the source node. The communication time is compared to a threshold value to determine whether the target node is local or remote relative to the source node.

FIG. 1 illustrates an example block diagram of a network of

10 nodes.

FIG. 2 illustrates an example block diagram of a source and target node that effect a query-response protocol in accordance with this invention.

Throughout the drawings, the same reference numeral refers to

15 the same element, or an element that performs substantially the same function.

FIG. 1 illustrates an example block diagram of a network 150 of nodes 110. One of the nodes, NodeD 110, is illustrated as being distant from the other nodes 110. In accordance with

20 this invention, each of the nodes 110 is configured to be able to determine the proximity of each other node 110. In a typical embodiment of this invention, the proximity determination is limited to a determination of whether the other node is "local" or "remote", although a more precise

25 determination of distance may also be determined, as detailed below.

FIG. 2 illustrates an example block diagram of a source node 110S and target node 110T that effect a query-response protocol to determine the proximity of the target node 110T

30 to the source node 110S in accordance with this invention. The source node 110S includes a processor 210 that initiates a query, and a communications device 220 that transmits the query to the target node 110T. The target node 110T receives

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the query and returns a corresponding response, via its
communications device 230. Conventional techniques, such as
the TCP/IP network command "ping" operation, can be used to
effect this query and response.

5   In a preferred embodiment, the query includes an
identification of the source node in a form that facilitates
a rapid response. For example, the query preferably includes
the address of the target node and the address of the source
node arranged in such a manner that the target node need only

10   strip its address from the query to form the response.
Generally, the response is generated at the processor 240 of
the target node 110T, although in a preferred embodiment, the
response to the query is generated automatically at the
communications device 230 of the target node, to minimize the

15   time required to process the query and generate the response,
illustrated in FIG. 2 as the processing time, $T_{process}$ 270.

The source node 110S is configured to measure the time
consumed by the query-response process, and from this
measure, to determine the proximity of the target node 110T.

20   The query-response time includes the time to communicate the
query and response, as well as the aforementioned processing
time at the target node 110T. The processing time will vary
based on the speed and configuration of the target node 110T.
Within a local network, the processing time may exceed the

25   actual communication time, $T_{communicate}$ 260, and thus the
measure of the communication time is unreliable. However, if
the target node 110T is remote from the source node 110S, the
communication time will generally be substantially longer
than the expected processing time, and thus the total time,

30     $T_{query-response}$ 280, can be expected to substantially correspond
to the communication time. By comparing the query-response
time to a nominal threshold value, typically not more than a
few milliseconds, the proximity of the target node 110T to

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the source node 110S can be determined. If the communication time is below the threshold, the target 110T is determined to be local; otherwise, it is determined to be remote. Optionally, multiple threshold levels may be defined to

5   distinguish different ranges of distances, such as whether a remote target node is located within the same country as the source node, and so on.

In a typical embodiment, the source 110S uses the remote/local proximity determination to control subsequent

10   communications with the target 110T. For example, some files may be permitted to be transferred only to local nodes, all communications with a remote node may be required to be encrypted, and so on.

The foregoing merely illustrates the principles of the

15   invention. It will thus be appreciated that those skilled in the art will be able to devise various arrangements which, although not explicitly described or shown herein, embody the principles of the invention and are thus within the spirit and scope of the following claims.